Shri Vile Parle Kelavani Mandal's
**DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING**
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

**Academic Year (2022-23)**

**Year:** 2 **Semester:** III
**Program:** S.Y.B. Tech. in Computer Engineering **Max. Marks:** 75
**Subject:** Discrete Structures **Time:** 10: 30 am to 1:30 pm
**Date:** 25/01/2023 **Duration:** 3 Hours

**REGULAR EXAMINATION**

**Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.**
**(1)** This question paper contains 03 pages.
**(2) All Questions are Compulsory.**
(3) All questions carry equal marks.
**(4) Answer to each new question is to be started on a fresh page.**
**(5) Figures in the brackets on the right indicate full marks.**
**(6) Assume suitable data wherever required, but justify it.**
**(7)** Draw the neat labelled diagrams, wherever necessary.

| Question No. | | Max. Marks |
|---|---|---|
| Q1 (a) | It was found that in first year of computer engineering of 80 students 50 knows Cobol, 55 know 'C', 46 knows Pascal. It was also known that 37 know 'C' and Cobol, 28 know 'C' and Pascal and 25 know Pascal and Cobol. 7 students however know none of the languages. Find:<br>1) How many know all the three languages?<br>2) How many know exactly two languages? | [08] |
| Q1 (b) | For the universe of all integers, let P(x), Q(x), R(x), S(x) and T(x) be the following statements:<br>P(x) : x > 0<br>Q(x): x is even<br>R(x): x is perfect square<br>S(x): x is divisible by 4<br>T(x): x is divisible by 5<br><br>Write the following statements in symbolic form:<br>1. At least one integer is even<br>2. There exist a positive integer that is even<br>3. If x is even, then x is not divisible by 5<br>4. No even integer is divisible by 5<br>5. There exist an even integer divisible by 5<br>6. If x is even and perfect square, then x is divisible by 4<br><br>**OR**<br>Prove by mathematical induction that $5^n - 1$ is divisible by 4. | [07]<br><br>[07] |

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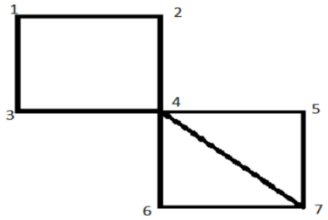
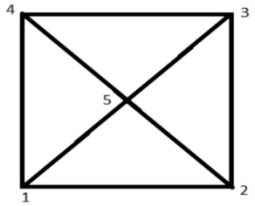
| Q2 (a) | i. State and explain Partial Ordering Relation. Also justify the same with the set A= {2, 3, 4, 5, 6, 7, 8} and Relation R = {(a, b) \|a divides b}.<br><br>ii. Let Z={a,b,c,d) where<br>R1={(a,a),(a,b),(b,d)}<br>R2={(a,d),(b,c),(b,d),(c,b)} find 1) R1 R2 2) R2R1 3) $R1^2$ 4)$R2^2$ 5)$R2^3$<br><br>**OR**<br><br>i. Set S= {a, b, c, d, e), given as<br>R = {(a, a),(a, d), (b, b) , (c, d) , (c, e) , (d, a), (e, b), (e, e)}<br>Find transitive closure using Warshall's Algorithm.<br><br>ii. If f: R->R and g: R->R are defined by the formulas f (x)=x+2 for all x in R and $g(x)=x^2$ for all x in R. Then check whether Composition of function is commutative. Explain with suitable example. | [06]<br><br>[04]<br><br><br><br>[05]<br><br><br>[05] |
| Q2 (b) | Using Laws of Logic determine whether the following proposition is a tautology or not.<br><br>((p V q) Λ ¬ ( ¬ p Λ (¬ q V ¬ r))) V (¬ p Λ ¬ q) V (¬ p Λ ¬ r) | [05] |
| Q3 (a) | Two dice are rolled together. What is the probability that sum of the faces will not exceed 7? Given that at least one face shows a 4.<br><br>OR<br><br>Solve following using Truth Table:<br><br>$(P \rightarrow Q) \wedge (Q \rightarrow R)$ | [05]<br><br><br>[05] |
| Q3 (b) | A man has 7 relatives, 4 of them are ladies and 3 men, his wife has 7 relatives and 3 of them are ladies and 4 men. In how many ways can they invite a dinner party of 3 ladies and 3 men so that there are 3 of man's relative and 3 of the wife's relative? | [10] |
| Q4 (a) | Determine whether the following graphs have Hamiltonian path, Hamiltonian circuit.<br><br>  <br>G1<br><br>  <br>G2<br><br>**OR** | [08] |

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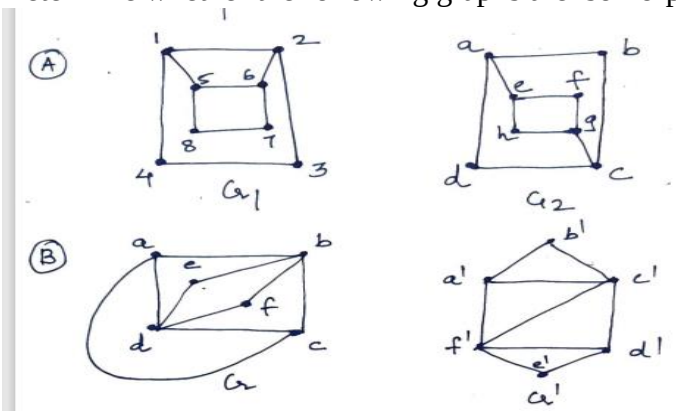
| | i. Determine number of edges in a graph with 6 nodes, 2 of degree is 4 and 4 of degree is 2. Draw Resultant graph.<br><br>ii. Solve following using Truth Table:<br><br>a) $[(p \rightarrow q) \wedge q] \rightarrow p$ | [04]<br><br>[04] |
| Q4 (b) | Determine whether the following graphs are isomorphic or not.<br>  | [07] |
| Q5 (a) | Solve the recurrence relation<br>$a_n - 7a_{n-1} + 10a_{n-2} = 0$ *with initial conditions* $a_0 = 1, a_1 = 6$ | [10] |
| Q5 (b) | Find the ordinary generating function for the following sequences.<br><br>a) {1,2,3,4,…}<br>b) **{**4,4,4,4,….}<br><br>OR<br><br>How many friends must you have to guarantee that at least five of them will have birthdays in the same month? | [05]<br><br><br><br><br>[05] |